replacing attenuation levels and equalizer tap values for the current remote site with the determined attenuation levels and equalizer tap values for the next remote site in an equalizer once the burst from the current remote site is completed;

storing the replaced attenuation levels and equalizer tap values for the current remote site for use with a subsequent burst from the current remote site;

receiving the next burst from the next remote site;

determining an initial phase and an initial gain for the received next burst from the next remote site; and

demodulating the received next burst from the next remote site using the determined initial phase, initial gain, and equalizer phase error.

27. The method of Claim 26, wherein determining attenuation levels and equalizer tap values for the next remote site is based on a previous burst from the next remote site.

A1 Cont.

2 ~~28~~. The method of Claim 1 ~~26~~, further comprising adjusting the replaced attenuation levels and equalizer tap values during receipt of the burst from the current remote site and storing the adjusted values.

3 ~~29~~. The method of Claim 1 ~~26~~, wherein demodulating the received next burst from the next remote site comprises:

applying the determined initial phase and the initial gain for the next remote site to an initial gain adjust module; and

applying the determined equalizer phase error for the next remote site to a numerically controlled oscillator.

4 ~~30~~. The method of Claim 1 ~~26~~, further comprising generating an index of remote sites.

5 ~~31~~. The method of Claim 1 ~~26~~, further comprising:

receiving equalizer tap values associated with the next burst from the next remote site;

determining a gain constant for the equalizer based on the received equalizer tap values; and

scaling the input signal of a subsequent burst from the next remote site to the equalizer to achieve a gain value of 1 based on the determined gain constant.



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6 ~~32~~. The method of Claim 5 ~~31~~, wherein scaling the input signal of the subsequent burst to the equalizer is performed by assigning a value to at least one of the equalizer tap values at the end of the next burst from the next remote site.

7 ~~33~~. The method of Claim 5 ~~31~~, further comprising compensating for gain variation by adjusting a center equalizer coefficient.

8 ~~34~~. The method of Claim 5 ~~31~~, further comprising storing at least one scaled equalizer tap value at the end of the next burst from the next remote site.

9 ~~35~~. The method of Claim 6 ~~32~~, wherein scaling is performed on all of the equalizer tap values.

10 ~~36~~. The method of Claim 6 ~~32~~, wherein scaling is performed on a center equalizer tap value at the end of the next burst from the next remote site.

11 ~~37~~. The method of Claim 10 ~~36~~, further comprising determining the gain for the equalizer from an angle of the center equalizer tap value.

A1 cont.

12 ~~38~~. The method of Claim 11 ~~37~~, wherein the angle includes a sine value.

13 ~~39~~. The method of Claim 11 ~~37~~, wherein the angle includes a cosine value.

14 ~~40~~. The method of Claim 1 ~~26~~, further comprising:

determining a noise value for the demodulated next burst from the next remote site;

determining an error value for the demodulated next burst from the next remote site;

if the determined noise value exceeds a threshold value, invalidating the attenuation levels and equalizer tap values;

if the determined error value exceeds a decode error threshold, invalidating the attenuation levels and equalizer tap values; and

storing the valid attenuation and equalizer tap values.

15 ~~41~~. The method of Claim 14 ~~40~~, wherein determining the noise value comprises determining a signal to noise ratio.

16 ~~42~~. The method of Claim 1 ~~26~~, further comprising:

receiving a two part preamble at the start of the next burst from the next remote site, wherein a first part is modulated using a lower order technique and the second part is modulated using a higher order technique than used for the first part; and



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driving the output of an adaptive filter in the equalizer to minimize errors associated with the demodulation of the next burst which follows the two part preamble.

17 ~~43~~. The method of Claim 16 ~~42~~, wherein the lower order technique is QPSK.

18 ~~44~~. The method of Claim 16 ~~42~~, wherein the higher order technique is QAM 64.

19 ~~45~~. The method of Claim 16 ~~42~~, wherein the higher order technique is QAM 16.

20 ~~46~~. The method of Claim 16 ~~42~~, wherein the first part and the second part of the preamble includes end points and middle QAM 64 points.

21 ~~47~~. The method of Claim 16 ~~42~~ wherein the received two part preamble is used for symbol timing recovery.

22 ~~48~~. The method of Claim 16 ~~42~~, wherein the errors associated with the demodulation of the next burst include a bit error rate and a reed solomon error rate.

23 ~~49~~. The method of Claim 1 ~~26~~, further comprising:

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generating an interrupt to the modem in response to a modem system error signal;

halting a modem interface once the modem system error occurs;

setting a reset bit once the modem is halted;

flushing a buffer once the reset bit is set;

realigning the buffer once the buffer is flushed;

reprogramming the buffer once the buffer is realigned; and

restarting the modem interface once the buffer is reprogrammed.

24 ~~50~~. The method of Claim 23 ~~49~~, wherein the reset bit is a transmit-reset bit.

25 ~~51~~. The method of Claim 23 ~~49~~, wherein the reset bit is a receive-reset bit.

26 ~~52~~. The method of Claim 23 ~~49~~, wherein the interrupt occurs during modem transmission.

27 ~~53~~. The method of Claim 23 ~~49~~, wherein the interrupt occurs during modem reception.

28 ~~54~~. The method of Claim 23 ~~49~~, wherein the interrupt is generated in response to the modem transmitting at a rate faster than the data is received by the modem.

29 ~~55~~. The method of Claim 28 ~~54~~, wherein the interrupt is generated in response to the modem receiving cyclic redundancy check packets.

30 ~~56~~. The method of Claim 29 ~~55~~, wherein the modem is transmitting using QAM 64.

Sub B57 57. The method of Claim 26, further comprising:



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determining an expected modulation type for the subsequent burst from the next remote site based on the determined initial phase and the initial gain for the next burst from the next remote site;

selecting an adaptation factor for the equalizer based on the expected modulation type; and

applying the selected adaptation factor to the subsequent burst such that the probability that the attenuation levels and tap values stored after demodulating the subsequent burst are correct is increased.

32 ~~58~~. The method of Claim 31 ~~57~~, wherein the expected modulation type is QPSK.

33 ~~59~~. The method of Claim 31 ~~57~~, wherein the expected modulation type is QAM 16.

34 ~~60~~. The method of Claim 31 ~~57~~, wherein the expected modulation type is QAM 64.

35 ~~61~~. The method of Claim 1 ~~26~~, further comprising:

A1 Cont.

correlating the input and output of the equalizer for the next burst from the next remote site;

determining an angle of correction for the subsequent burst from the next remote site based on the correlation; and

shifting the subsequent burst by applying the determined angle of correction to the subsequent burst.

36 ~~62~~. The method of Claim 35 ~~61~~, wherein the angle of correction is determined using the equation $\o_{eq} = angle\ (c_o + 0.627c_1)$, wherein $c_o$ is the center tap value, and wherein $c_1$ is an adjacent tap value.

37 ~~63~~. A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for gain droop in the modem transmitter, the method comprising:

receiving equalizer tap values associated with a burst from a next remote site;

determining a gain constant for an equalizer based on the received equalizer tap values; and

scaling the input signal of a next burst to the equalizer to achieve a gain value of 1 based on the determined gain constant.

38 ~~64~~. The method of Claim 37 ~~63~~, wherein scaling the input signal is performed by assigning a value to at least one equalizer coefficient at the end of the burst.



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39 ~~65~~. The method of Claim 37 ~~63~~, further comprising storing at least one scaled equalizer coefficient value at the end of the burst.

40 ~~66~~. The method of Claim 38 ~~64~~, wherein scaling is performed on all of the equalizer coefficients.

41 ~~67~~. The method of Claim 38 ~~64~~, wherein scaling is performed on the center equalizer coefficient.

42 ~~68~~. The method of Claim 41 ~~67~~, further comprising determining the gain for the equalizer from the angle of the center equalizer coefficient at the end of the burst.

43 ~~69~~. The method of Claim 42 ~~68~~, wherein the calculated angle includes a sine value.

44 ~~70~~. The method of Claim 42 ~~68~~, wherein the calculated angle includes a cosine value.

45 ~~71~~. The method of Claim 37 ~~63~~, further comprising compensating for gain variation is performed by the center equalizer coefficient.

Sub B6 7 ~~72~~. A modem system for demodulating data bursts from a plurality of remote sites using stored channel parameters for the remote sites, the system comprising:

A1 Cont

an acquisition, tracking, and modulation control module configured to determine the expected sequence of bursts from a plurality of remote sites for a modem;

a correlation, timing recovery module in communication with the acquisition, tracking, and modulation control module and configured to determine when a burst from one of the plurality of remote sites is received by the modem;

a parameter memory module configured to store equalizer tap values associated with each of the plurality of remote sites identified by the acquisition, tracking, and modulation control module;

a feed forward tap update module configured to generate feed forward equalizer tap values based on the burst from one of the plurality of remote sites for storage in the parameter memory module;

a decision feedback equalization adaptive algorithm module configured to generate feedback equalizer tap values for storage in the parameter memory module;

a first temporary buffer configured to store attenuation levels and tap values recalled by the modem from the parameter storage memory for a next remote site; and



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a second temporary buffer configured to store attenuation levels and tap values for a current remote site prior to storing the attenuation levels and tap values in the parameter memory module.

~~73~~. A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for gain droop in the modem transmitter, the system comprising:

an equalizer;

a phase calculator circuit configured to determine the gain of the equalizer for a demodulated data burst from a remote site; and

a processor in communication with the phase calculator and the equalizer, and configured to apply the determined gain of the equalizer to at least one equalizer coefficient.

~~74~~. A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for errors, the method comprising:

A1 Cont

retrieving a stored channel parameter associated with a remote site;

demodulating an incoming burst from the remote site using the retrieved stored channel parameter;

determining a noise value for the demodulated burst;

determining an error value for the demodulated burst;

if the determined noise value exceeds a threshold value, invalidating the retrieved stored channel parameter;

if the determined error value exceeds a decode error threshold, invalidating the retrieved stored channel parameter; and

storing the valid channel parameter.

75. The method of Claim 74, wherein the method is implemented in a Time Division Duplex system.

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~~76~~. A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for errors, the system comprising:



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an acquisition, tracking, and modulation control module which determines the expected sequence of bursts from a plurality of remote sites;

a signal to noise (SNR) calculator configured to calculate a received symbol signal to noise ratio for a burst from a remote site;

a reed-solomon decoder module configured to calculate a received symbol decode error rate for the burst from the remote site;

an error recovery module in communication with the acquisition, tracking, and modulation control module and configured to compare the errors calculated by the SNR calculator and the reed-solomon decoder module for the burst from the remote site to threshold values; and

a parameter memory module in communication with the error recovery module and configured to store equalizer tap values associated with the remote site if the threshold values are not exceeded.

A1 cont'd

77. The system of Claim 76, wherein the system is implemented in a Time Division Duplex system.

46 ~~78~~. A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and improves the convergence of the modem, the method comprising:

transmitting a first part of a preamble that is modulated using a lower order technique;

transmitting a second part of the preamble after transmitting the first part of the preamble, wherein the second part of the preamble is modulated using a higher order technique than the modulation technique used for the first part;

receiving the transmitted preamble at the modem; and

driving the output of an adaptive filter in communication with the modem to a known state based on the received preamble.

47 ~~79~~. The method of Claim 46 ~~78~~, wherein the lower order technique is QPSK.

48 ~~80~~. The method of Claim 46 ~~78~~, wherein the higher order technique is QAM 64.

49 ~~81~~. The method of Claim 46 ~~78~~, wherein the higher order technique is QAM 16.

50 ~~82~~. The method of Claim 46 ~~78~~, wherein the first part and the second part of the preamble includes end points and middle QAM 64 points.



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~~83~~ 51. The method of Claim ~~78~~ 46, wherein the received preamble is used for symbol timing recovery.

~~84~~ 52. The method of Claim ~~78~~ 46, wherein the method is implemented in a Time Division Duplex system.

~~85~~. A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and improves the convergence of the modem, the system comprising:

a feed forward tap update module configured to generate equalizer tap values based on an initial gain and equalizer error determined from a two part preamble of a data burst; and

an adaptive filter in communication with the feed forward tap update module and configured to correct for distortion and interference in the received symbols of the burst using the generated equalizer tap values.

A1 cont'd

~~86~~. A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and an adaptation factor, the method comprising:

determining a gain value and a phase value for a first data burst from a remote site;

comparing the gain value and phase value based on an adaptive modulation algorithm;

determining an expected modulation type for a second data burst from the remote site based on the comparison;

selecting an adaptation factor based on the expected modulation type; and

applying the selected adaptation factor to the second data burst.

87. The method of Claim 86, wherein the expected modulation type is QPSK.

88. The method of Claim 86, wherein the expected modulation type is QAM 16.

89. The method of Claim 86, wherein the expected modulation type is QAM 64.

Sub B8 ~~90~~. A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and an adaptation factor to improve the probability that the stored channel characteristics will be valid, the system comprising:



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a reed solomon decoder configured to determine channel characteristics and metrics for a burst from a remote site;

a signal to noise ratio calculator module configured to determine channel characteristics and metrics for the burst from the remote site;

an adaptive modulation algorithm in communication with the reed solomon decoder and the signal to noise ratio calculator module and configured to compare the determined channel characteristics and metrics; and

an acquisition, tracking and modulation control module in communication with the adaptive modulation algorithm and configured to determine an adaptation factor for use with a next burst received from the remote site based on the comparison.

A1 Cont.

~~91~~. A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site which corrects the phase shift caused by the storage of equalizer tap values, the method comprising:

correlating the input and output of an equalizer for a received data burst from a next remote site;

determining an angle of correction for an incoming data burst from the next remote site based on the correlation; and

shifting the incoming data burst by applying the determined angle of correction to the incoming data burst.

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92. The method of Claim 91, further comprising determining the angle of correction using the equation $\o_{eq} = angle\ (c_o + 0.627c_1)$, wherein $c_o$ is the center tap value, and wherein $c_1$ is an adjacent tap value.

54 ~~93~~. The method of Claim 53 ~~92~~, wherein the method is implemented in a Time Division Duplex system.

~~94~~. A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and corrects for phase shift caused by the storage of equalizer taps, the system comprising:

a decision feedback equalizer adaptation module configured to determine an angle of correction for an incoming data burst from a next remote site; and

shifting the incoming data burst by applying the determined angle of correction to the incoming data burst.

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